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THE

TWO RECORDS:

THE

MOSAIC AND THE GEOLOGICAL.

A Lecture

DELIVERED BEFORE THE YOUNG MENS' CHRISTIAN ASSOCIATION,
IN EXETER HALL, LONDON.

BY

HUGH MILLER,

AUTHOR OF THE "OLD RED SANDSTONE," "FOOTPRINTS OF THE CREATOR,"
"FIRST IMPRESSIONS OF ENGLAND AND ITS PEOPLE," ETC. ETC.

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THE TWO RECORDS:

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MOSAIC AND THE GEOLOGICAL.

It is now exactly fifty years since a clergyman of the Scottish Church, engaged in lecturing at St. Andrews, took occasion, in enumerating the various earths of the chemist, to allude to the science, then in its infancy, that specially deals with the rocks and soils which these earths compose. "There is a prejudice," he remarked, "against the speculations of the geologist which I am anxious to remove. It has been said that they nurture infidel propensities. It has been alleged that geology, by referring the origin of the globe to a higher antiquity than is assigned to it by the writings of Moses, undermines our faith in the inspiration of the Bible, and in all the animating prospects of the immortality which

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it unfolds. This is a false alarm. *The writings of Moses do not fix the antiquity of the globe.*"

The bold lecturer on this occasion, — for it needed no small courage in a divine of any established church to take up, at the beginning of the present century, a position so determined on the geologic side, — was at the time an obscure young man, characterized, in the small circle in which he moved, by the ardor of his temperament and the breadth and originality of his views; but not yet distinguished in the science or literature of his country, and of comparatively little weight in the theological field. He was marked, too, by what his soberer acquaintance deemed eccentricities of thought and conduct. When the opposite view was all but universal, he held and taught that Free Trade would be not only a general benefit to the people of this country, but would inflict permanent injury on no one class or portion of them; and, further, at a time when the streets and lanes of all the great cities of the empire were lighted with oil burnt in lamps, he held that the time was not distant when a carburetted hydrogen gas would be substituted instead; and, on getting his snug parsonage-house repaired, he actually introduced into the walls a system of tubes and pipes for the passage into its various rooms of the gaseous fluid yet to be employed as the illuminating agent. Time and Experience have

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since impressed their stamp on these supposed eccentricities, and shown them to be the sagacious forecastings of a man who saw further and more clearly than his contemporaries; and Fame has since blown his name very widely as one of the most comprehensive and enlightened, and, withal, one of the most thoroughly earnest and sincere of modern theologians. The bold lecturer of St. Andrews was Dr. Thomas Chalmers —a divine whose writings are now known wherever the English language is spoken, and whose wonderful eloquence lives in memory as a vanished power, which even his extraordinary writings fail adequately to represent. And in the position which he took up at this early period with respect to geology and the Divine Record, we have yet another instance of the great sagacity of the man, and of his ability of correctly estimating the prevailing weight of the evidence with which, though but partially collected at the time, the geologist was preparing to establish the leading propositions of his science. Even in this late age, when the scientific standing of geology is all but universally recognized, and the vast periods of time which it demands fully conceded, neither geologist nor theologian could, in any new scheme of reconciliation, shape his first proposition more skilfully than it was shaped by Chalmers a full half century ago. It has formed, since that time, the preliminary

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proposition of those ornaments of at once science and the English Church, your present venerable Archbishop of Canterbury, Dr. Bird Sumner, — with Doctors Buckland, Conybeare, and Professor Sedgwick, — of eminent evangelistic Dissenters, too, — such as the late Dr. Pye Smith, Dr. John Harris, Dr. Robert Vaughan, Dr. James Hamilton, and the Rev. Mr. Binney — enlightened and distinguished men, who all alike came early to the conclusion, with the lecturer of St. Andrews, that "the writings of Moses do not fix the antiquity of the globe."

In 1814, ten years after the date of the St. Andrews' lectures, Dr. Chalmers produced his more elaborate scheme of reconciliation between the Divine and the Geologic Records in a "Review of Cuvier's Theory of the Earth;" and that scheme, perfectly adequate to bring the Mosaic narrative into harmony with what was known at the time of geologic history, has been very extensively received and adopted. It may, indeed, still be regarded as the most popular of the various existing schemes. It teaches, and teaches truly, that between the first act of creation, which evoked out of the previous nothing the *matter* of the heavens and earth, and the first act of the first day's work recorded in Genesis, periods of vast duration may have intervened; but, further, it insists that the days themselves were but natural days of twenty-four hours each;

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and that, ere they began, the earth, though, mayhap, in the previous period, a fair residence of life, had become void and formless, and the sun, moon, and stars, though, mayhap, they had before given light, had been, at least in relation to our planet, temporarily extinguished. In short, while it teaches that the successive creations of the geologist may all have found ample room in the period preceding that creation to which man belongs, it teaches also that the record in Genesis bears reference to but the existing creation, and that there lay between it and the preceding ones a chaotic period of death and darkness. The scheme propounded by the late truly admirable Dr. Pye Smith, and since adopted by several writers, differs from that of Chalmers in but one circumstance, though an important one. Dr. Smith held, with the great northern divine, that the Mosaic days were natural days; that they were preceded by a chaotic period; and that the work done in them related to but that last of the creations to which the human species belongs. Further, however, he held, in addition, that the chaos of darkness and confusion out of which that creation was called was of but limited extent, and that outside its area, and during the period of its existence, many of our present lands and seas may have enjoyed the light of the sun, and been tenanted by animals, and occupied by plants, the descendants of which still continue

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to exist. The treatise of Dr. Pye Smith was published exactly a quarter of a century posterior to the promulgation, through the press, of the argument of Dr. Chalmers; and this important addition, — elaborated by its author between the years 1837 and 1839, — seems to have been made to suit the more advanced state of geological science at the time. The scheme of reconciliation, perfectly adequate in 1814, was found in 1839 to be no longer so; and this mainly through a peculiarity in the order in which geological fact has been evolved and accumulated in this country, and the great fossiliferous systems studied and wrought out, to which I must be permitted briefly to advert.

William Smith, the "Father of English Geology," as he has been well termed (a humble engineer and mineral surveyor, possessed of but the ordinary education of men of his class and profession) was born upon the English Oolite — that system which, among the five prevailing divisions of the great Secondary class of rocks, holds exactly the middle place. The Triassic system and the Lias lie beneath it; the Cretaceous system and the Weald rest above. Smith, while yet a child, had his attention attracted by the Oolitic fossils; and it was observed, that while his youthful contemporaries had their garnered stores of marbles, purchased at the toy-shop, he had collected instead a hoard of spherical fossil

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terebratula, which served the purposes of the game equally well. The interest which he took in organic remains, and the deposits in which they occur, influenced him in the choice of a profession; and when supporting himself in honest independence as a skilful mineral surveyor and engineer, he travelled over many thousand miles of country, taking as his starting point the city of Bath, which stands near what is termed the Great Oolite; and from that centre he carefully explored the various Secondary formations above and below. He ascertained that these always occur in a certain determinate order; that each contains fossils peculiar to itself; and that they run diagonally across the kingdom, in nearly parallel lines, from north-east to south-west. And, devoting every hour which he could snatch from his professional labors to the work, in about a quarter of a century, or rather more, he completed his great stratigraphical map of England. But, though a truly Herculean achievement, regarded as that of a single man unindebted to public support, and uncheered by even any very general sympathy in his labors, it was found to be chiefly valuable in its tracings of the Secondary deposits, and strictly exact in only that Oolitic centre from which his labors began. It was remarked, at an early period, that he ought to have restricted his publication to the formations which lie between the Chalk and the Red-

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marl, inclusive; or, in other words, to the great Secondary division. The Coal Measures had, however, been previously better known, from their economic importance, and the number of the workings opened among them, than the deposits of any other system; and ere the publication of the map of Smith, Cuvier, and Brongniart had rendered famous all over the world the older Tertiary formations of the age of the London clay. But both ends of the geological scale, comprising those ancient systems older than the Coal, and representative of periods in which, so far as is yet known, life, animal and vegetable, first began upon our planet, and those systems of comparatively modern date, representative of the periods which immediately preceded the human epoch, were equally unknown. The light fell strongly on only that middle portion of the series on which the labors of Smith had been mainly concentrated. The vast geologic bridge, which, like that in the exquisite allegory of Addison, strode across a "part of the great tide of eternity," "had a black cloud hanging at each end of it." And such was the state of geologic science when, in 1814, Dr. Chalmers framed his scheme of reconciliation.

Since that time, however, a light not less strong than the one thrown by William Smith on the formations of the Lias and the Oolite has been cast on both the older and the newer fossiliferous

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systems. Two great gaps still remain to be filled up; that which separates the Palæozoic from the Secondary division, and that which separates the Secondary from the Tertiary one. But they occur at neither end of the geological scale. Mainly through the labors of two distinguished geologists, who, finding the geologic school of their own country distracted by a fierce and fruitless controversy, attached themselves to the geologic school of England, and who have since both received the honor of knighthood in reward of their labors, both ends of the geologic scale have been completed. Sir Roderick Murchison addressed himself to the formations older than the Coal — more especially to the Upper and Lower Silurian systems, from the Ludlow rocks to the Llandeilo flags. The Old Red sandstone, too, a system which lies more immediately beneath the Coal, has also been explored, and its various deposits, with their peculiar organic remains, enumerated and described. And Sir Charles Lyell, setting himself to the other extremity of the scale, has wrought out the Tertiary formations, and separated them into the four great divisions which they are now recognized as forming. And of these, the very names indicate that certain proportions of their organisms still continue to exist. It is a great fact, now fully established in the course of geological discovery, that between the plants which, in the

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present time, cover the earth, and the animals which inhabit, and the animals and plants of the later extinct creations, there occurred no break or blank, but that, on the contrary, many of the existing organisms were contemporary, during the morning of their being, with many of the extinct ones during the evening of theirs. We know, further, that not a few of the shells which now live on our coasts, and several of even the wild animals which continue to survive amid our tracts of hill and forest, were in existence many ages ere the human age began. Instead of dating their beginning only a single natural day, or at most two natural days, in advance of man, they must have preceded him by many thousand years. In fine, in consequence of that comparatively recent extension of geologic fact in the direction of the later systems and formations, through which we are led to know that the present creation was not cut off abruptly from the preceding one, but that, on the contrary, it dovetailed into it at a thousand different points, we are led also to know, that any scheme of reconciliation which would separate between the recent and the extinct existences by a chaotic gulf of death and darkness, is a scheme which no longer meets the necessities of the case. Though perfectly adequate forty years ago, it has been greatly outgrown by the progress of geological discovery, and is, as I have said, ade-

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quate no longer; and it becomes a not unimportant matter to determine the special scheme that would bring into completest harmony the course of creation, as now ascertained by the geologist, and that brief but sublime narrative of its progress which forms a meet introduction in Holy Writ to the history of the human family. The first question to which we must address ourselves in any such inquiry is, of course, a very obvious one — *What are the facts scientifically determined which now demand a new scheme of reconciliation?*

There runs around the shores of Great Britain and Ireland a flat terrace of unequal breadth, backed by an escarpment of varied height and character, which is known to geologists as the Old Coast-line. On this flat terrace most of the seaport towns of the empire are built. The subsoil, which underlies its covering of vegetable mould, consists usually of stratified sands and gravels, arranged after the same fashion as on the neighboring beach, and interspersed in the same manner with sea-shells. The escarpment behind, when formed of materials of no great coherency, such as gravel or clay, exists as a sloping, grass-covered bank, — at one place running out into promontories, that encroach upon the terrace beneath, at another receding into picturesque, bay-like recesses; and where composed, as in many localities, of rock of an endur-

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ing quality, we find it worn, as if by the action of the surf, — in some parts relieved into insulated stacks, in others hollowed into deep caverns, — in short, presenting all the appearances of a precipitous coast-line, subjected to the action of the waves. Now, no geologist can, or does, doubt that this escarpment was at one time the coast-line of the island — the line against which the waves broke at high-water in some distant age, when either the sea stood from twenty to thirty feet higher along our shores than it does now, or the land sat from twenty to thirty feet lower. Nor can the geologist doubt that along the flat terrace beneath, with its stratified beds of sand or gravel, and its accumulations of sea-shells, the tides must have risen and fallen twice every day, as they now rise and fall along the beach that girdles our country. But, in reference to at least human history, the age of the Old Coast-line and terrace must be a very remote one. Though geologically recent, it lies far beyond the reach of any written record. It has been shown by Mr. Smith, of Jordan Hill, one of our highest authorities on the subject, that the wall of Antoninus, erected by the Romans as a protection against the Northern Caledonians, was made to terminate at the Firths of Forth and Clyde, with relation — not to the level of the Old Coast-line — but to that of the existing one. And so we must infer that, ere the year

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A. D. 140 (the year during which, according to our antiquaries, the greater part of the wall was erected) the Old Coast-line had attained to its present elevation over the sea. Further, however, we know from the history of Diodorus the Sicilian, that at a period earlier by at least two hundred years, St. Michael's Mount, in Cornwall, was connected with the mainland at low water, just as it is now, by a flat isthmus, across which, upon the falling of the tide, the ancient Cornish miners used to carry over their tin in carts. Had the relative levels of sea and land been those of the Old Coast-line at the time, St. Michael's Mount, instead of being accessible at low ebb, would have been separated from the shore by a strait from three to five fathoms in depth. It would not have been then as now, as described in the verse of Carew —

"Both land and island twice a day."

But even the incidental notice of Diodorus Siculus represents very inadequately the antiquity of the existing coast-line. Some of its caves, hollowed in hard rock in the line of faults and shifts by the attrition of the surf, are more than a hundred feet in depth; and it must have required many centuries to excavate tough trap or rigid gneiss to a depth so considerable by a process so slow. And yet, however long the sea may have stood against the present coast-line, it

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must have stood for a considerably longer period against the ancient one. The latter presents generally marks of greater attrition than the modern line, and its wave-hollowed caves are of a depth considerably more profound. In determining, on an extensive tract of coast, the average profundity of both classes of caverns, from a considerable number of each, I ascertained that the proportional average depth of the modern to the ancient is as two to three. For every two centuries, then, during which the waves have been scooping out the caves of the present coast-line, they must have been engaged for three centuries in scooping out those of the old one. But we know, *historically*, that for at least twenty centuries the sea has been toiling in these modern caves; and who shall dare affirm that it has not been toiling in them for at least ten centuries more? But if the sea has stood for but even two thousand six hundred years against the present coast-line (and no geologist would dare fix his estimate lower), then must it have stood against the old line, ere it could have excavated caves one third deeper, three thousand nine hundred years. And both periods united (six thousand five hundred years) more than exhaust the Hebrew chronology. Yet what a mere beginning of geologic history does the epoch of the Old Coast-line form! It is but a mere starting-point from the recent period. Not

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a single shell seems to have become extinct during the last six thousand five hundred years! The shells which lie embedded in the subsoils beneath the Old Coast-line are exactly those which still live in our seas.

Above this ancient line of coast, we find at various heights beds of shells of vastly older date than those of the lowlying terrace, and many of which are no longer to be found living around our shores. I spent some time last autumn in exploring one of these beds — once a sea-bottom, but now raised two hundred and thirty feet over the sea — in which there occurred great numbers of shells now not British, though found in many parts of Britain at heights varying from two hundred to nearly fourteen hundred feet over the existing sea-level. But though no longer British shells, they are shells that still continue to live in high northern latitudes, as on the shores of Iceland and Spitzbergen; and the abundance in which they were developed on the submerged plains and hill-sides of what are now England and Scotland, during what is termed the Pleistocene period, shows of itself what a very protracted period that was. The prevailing shell of the bed which I last explored, — a bed which occurs in some places six miles inland, in others elevated on the top of dizzy crags — is a subartic tellina (*Tellina proxima*), of which only dead valves are now to be detected on our coasts,

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but which may be found living at the North Cape, and in Greenland. In this elevated Scottish bed, of the Pleistocene period, I laid this boreal shell open to the light by hundreds, on the spot evidently where the individuals had lived and died. Under the severe climatal conditions to which (probably from some change in the direction of the Gulf-stream) what is now Northern Europe had been brought, this tellina had increased and multiplied until it became a prevailing shell of the British area; and this increase must have been the slow work of ages, during which the plains — and not a few of the table-lands — of the country were submerged in a sub-arctic sea, and Great Britain existed as but a scattered archipelago of wintry islands. But in a still earlier period, of which there exists unequivocal evidence in the buried forests of Happisburg and Cromer, the country had not only its head above water, as now, but seems to have possessed, even more than its present breadth of surface. During this ancient time — more remote by many centuries than not only the times of the Old Coast-line, but than even those of the partial submergence of the island — that northern mammoth lived in great abundance, of which the remains have been found by hundreds in England alone, together with the northern hippopotamus, and at least two northern species of rhinoceros. And though they have all ceased to exist, with their

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wild associates in the forests and jungles of the Pleistocene, the cave-hyæna, the cave-tiger, and the cave-bear, we know that the descendants of some of their feebler contemporaries, such as the badger, the fox, and the wild cat, still live amid our hills and brakes. The trees, too, under which they roamed, and whose remains we find buried in the same deposits as theirs, were of species that still hold their place as aboriginal trees of the country, or of at least the more northerly provinces of the continent. The common Scotch fir, the common birch, and a continental species of conifer of the far north, the Norwegian spruce (*Abies excelsa*), have been found underlying the Pleistocene drift, and rooted in the Mammiferous Crag; and for many ages must the old extinct elephant have roamed amid these familiar trees. From one limited tract of sea-bottom on the Norfolk coast, the fishermen engaged in dredging oysters brought ashore, in the course of thirteen years (from 1820 to 1833), no fewer than two thousand elephants' grinders, besides great tusks and numerous portions of skeletons. It was calculated that these remains could not have belonged to fewer than five hundred individual mammoths of English growth; and various in their states of keeping, and belonging to animals of which only a few at a time could have found sufficient food in a limited tract of country, the inference seems inevitable,

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that they must have belonged, not to one or two, but to many succeeding generations. The further fact, that remains of this ancient elephant (*Elephas primigenius*) occur all round the globe in a broad belt, extending from the fortieth to near the seventieth degree of north latitude, leads to the same conclusion. It must have required many ages ere an animal that breeds so slowly as the elephant could have extended itself over an area so vast.

Many of the contemporaries of this northern mammoth, especially of its molluscan contemporaries, continue, as I have said, to live in their descendants. Of even a still more ancient period, represented by the Red Crag, seventy out of every hundred species of shells still exist; and of an older period still, represented by the Coralline Crag, there survive sixty out of every hundred. In the Red Crag, for instance, we find the first known ancestors of our common edible periwinkle and common edible mussel; and in the Coralline Crag the first known ancestors of the common horse-mussel, the common whelk, the common oyster, and the great pecten. There then occurs a break in the geologic deposits of Britain, which, however, in other parts of Europe we find so filled up as to render it evident that no corresponding break took place in the chain of existence; but that, on the contrary, from the present time up to the times represented

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by the earliest Eocene formations of the Tertiary division, day has succeeded day, and season has followed season, and that no chasm or hiatus — no age of general chaos, darkness, and death, has occurred to break the line of succession, or check the course of life. All the evidence runs counter to the supposition, that immediately before the appearance of man upon earth there existed a chaotic period which separated the previous from the present creation. Up till the commencement of the Eocene ages, if even then, there was no such chaotic period in at least what is now Britain and the European continent; — the persistency from a high antiquity of some of the existing races, of not only plants and shells, but of even some of the mammiferous animals, such as the badger, the goat, and the wild cat, prove there was not; and any scheme of reconciliation which takes such a period for granted must be deemed as unsuited to the present state of geologic knowledge, as any scheme would have been forty years ago which took it for granted that the writings of Moses *do* "fix the antiquity of the globe."

The scheme of reconciliation adopted by the late Dr. Pye Smith, though, save in one particular, identical, as I have said, with that of Dr. Chalmers, is made, in virtue of its single point of difference, to steer clear of the difficulty. Both schemes exhibit the creation, recorded in

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Genesis, as an event which took place about six thousand years ago; both describe it as begun and completed in six natural days; and both represent it as cut off from a previously existing creation by a chaotic period of death and darkness. But while, according to the scheme of Chalmers, both the Biblical creation and the previous period of death are represented as coextensive with the globe, they are represented, according to that of Dr. Smith, as limited and local. They may have extended, it is said, over only a few provinces of Central Asia, in which, when all was life and light in other parts of the globe, there reigned for a time only death and darkness amid the welterings of a chaotic sea; and which, at the Divine command, was penetrated by light, and occupied by dry land, and ultimately, ere the end of the creative week, became a centre in which certain plants and animals, and finally man himself, were created. And this scheme, by leaving to the geologist in this country and elsewhere, save, mayhap, in some unknown Asiatic district, his unbroken series, certainly does not conflict with the facts educed by geologic discovery. It virtually removes Scripture altogether out of the field. I must confess, however, that on this, and on some other accounts, it has failed to satisfy me. I have stumbled, too, at the conception of a merely local and limited chaos, in which the darkness would be so complete, that

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when first penetrated by the light, that penetration could be described as actually a *making* or creation of light; and that, while life obtained all around its precincts, could yet be thoroughly void of life. A local darkness, so profound as to admit no ray of light, seems to have fallen for a time on Egypt, as one of the ten plagues; but the event was evidently miraculous; and no student of natural science is entitled to have recourse, in order to extricate himself out of a difficulty, to supposititious, unrecorded miracle. Creation cannot take place without miracle; but it would be a strange reversal of all our previous conclusions on the subject, should we have to hold that the dead, dark blank out of which creation arose was miraculous also. And if, rejecting miracle, we cast ourselves on the purely natural, we find that the local darknesses, dependent on known causes, of which we have any record in history, were always either very imperfect, — like the darkness of your London fogs, — or very temporary, — like the darkness described by Pliny, as occasioned by a cloud of volcanic ashes; — and so, altogether inadequate to meet the demands of a hypothesis such as that of Dr. Smith. And yet, further, I am disposed, I must add, to look for a broader and more general meaning in that grand description of the creation of all things, with which the Divine Record so appropriately opens, than I could recognize it as forming, were I

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assured it referred to but one of many existing creations — a creation restricted to, mayhap, a few hundred square miles of country, and to, mayhap, a few scores of animals and plants. What, then, is the scheme of reconciliation which I would venture to propound?

Let me first remark, in reply, that I come before you this evening, not as a philologist, but simply as a student of geological fact, who, believing his Bible, believes also, that though theologians have at various times striven hard to pledge it to false science, geographical, astronomical, and geological, it has been pledged by its Divine Author to no falsehood whatever. I occupy exactly the position now, with respect to geology, that the mere Christian geographer would have occupied with respect to geography in the days of those doctors of Salamanca, who deemed it unscriptural to hold with Columbus that the world is round — not flat; or exactly the position which the mere Christian astronomer would have occupied, with respect to astronomy, in the days of that Francis Turretin, who deemed it unscriptural to hold with Newton and Galileo, that it is the earth which moves in the heavens, and the sun which stands still. The mere geographer or astronomer might have been wholly unable to discuss with Turretin or the doctors the niceties of Chaldaic punctuation, or the various meanings of the Hebrew verbs. But

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this much, notwithstanding, he would be perfectly qualified to say: — However great your skill as linguists, your reading of what you term the scriptural geography or scriptural astronomy must of necessity be a false reading, seeing that it commits Scripture to what, in my character as a geographer or astronomer, I know to be a monstrously false geography or astronomy. Premising, then, that I make no pretensions to even the slightest skill in philology, I remark, further, that it has been held by accomplished philologists, that the days of the Mosaic creation may be regarded, without doing violence to the genius of the Hebrew language, as successive periods of great extent. And, certainly, in looking at my English Bible, I find that the portion of time spoken of in the first chapter of Genesis as *six* days, is spoken of in the second chapter as *one* day. True, there are other philologers, such as the late Professor Moses Stuart, who take a different view; but then I find this same Professor Stuart striving hard to make the phraseology of Moses "fix the antiquity of the globe;" — and so, as a mere geologist, I reject his philology, on exactly the same principle on which the mere geographer would reject, and be justified in rejecting, the philology of the doctors of Salamanca, or on which the mere astronomer would reject, and be justified in rejecting, the philology of Turretin and the old Franciscans. I would,

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in any such case, at once, and without hesitation, cut the philological knot, by determining that that philology cannot be sound which would commit the Scriptures to a science that cannot be true. Waving, however, the question as a philological one, and simply holding with Cuvier, Parkinson, and Silliman, that each of the *six* days of the Mosaic narrative in the first chapter were what is assuredly meant by the *day* referred to in the second — not natural days, but lengthened periods — I find myself called on, as a geologist, to account for but three of the six. Of the period during which light was created — of the period during which a firmament was made to separate the waters from the waters — or of the period during which the two great lights of the earth, with the other heavenly bodies, became visible from the earth's surface, we need expect to find no record in the rocks. Let me, however, pause for a moment, to remark the peculiar character of the language in which we are first introduced in the Mosaic narrative to the heavenly bodies — sun, moon, and stars. The moon, though absolutely one of the smallest lights of our system, is described as secondary and subordinate to only its greatest light, the sun. It is the apparent, then, not the actual, which we find in the passage — what *seemed* to be, not what *was;* and as it was merely what appeared to be greatest that was described as greatest, on

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what grounds are we to hold that it may not also have been what appeared at the time to be made that has been described as made? The sun, moon, and stars, may have been created long before, though it was not until this fourth period of creation that they became visible from the earth's surface.

The geologist, in his attempts to collate the Divine with the geologic record, has, I repeat, only three of the six periods of creation to account for—the period of plants, the period of great sea-monsters and creeping things, and the period of cattle and beasts of the earth. He is called on to question his systems and formations regarding the remains of these three great periods, and of these only. And the question once fairly stated, what, I ask, is the reply? All geologists agree in holding that the vast geological scale naturally divides into *three* great parts. There are many lesser divisions—divisions into systems, formations, deposits, beds, strata;—but the master divisions, in each of which we find a type of life so unlike that of the others, that even the unpractised eye can detect the difference, are simply three,—the Palæozoic, or oldest fossiliferous division; the Secondary, or middle fossiliferous division; and the Tertiary, or latest fossiliferous division.

In the first, or Palæozoic division, we find corals, crustaceans, molluscs, fishes, and, in its

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later formations, a few reptiles. But none of these classes of organisms give its leading character to the Palæozoic,—they do not constitute its prominent feature, or render it more remarkable as a scene of life than any of the divisions which followed. That which chiefly distinguished the Palæozoic from the Secondary and Tertiary periods was its gorgeous flora. It was emphatically the period of plants,—"of herbs yielding seed after their kind." In no other age did the world ever witness such a flora;—the youth of the earth was peculiarly a green and umbrageous youth—a youth of dusk and tangled forests—of huge pines and stately araucarias—of the reed-like calamite—the tall tree-fern—the sculptured sigillaria—and the hirsute lepidodendron. Wherever dry land, or shallow lake, or running stream appeared, from where Melville Island now spreads out its ice-wastes, under the star of the Pole, to where the arid plains of Australia lie solitary, beneath the bright cross of the south, a rank and luxuriant herbage cumbered every foot-breadth of the dank and steaming soil; and even to distant planets our earth must have shone through the enveloping cloud with a green and delicate ray. Of this extraordinary age of plants, we have our cheerful remembrancers and witnesses in the flames that roar in our chimneys when we pile up the winter fire,—in the brilliant gas that now casts its light

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on this great assemblage, and that brightens up the streets and lanes of this vast city,—in the glowing furnaces that smelt our metals, and give moving power to our ponderous engines,—in the long dusky trains that, with shriek and snort, speed dart-like athwart our landscapes,—and in the great cloud-enveloped vessels that darken the lower reaches of your noble river, and rush in foam over ocean and sea. The geologic evidence is so complete as to be patent to all, that the first great period of organized being was, as described in the Mosaic record, peculiarly a period of herbs and trees, "yielding seed after their kind."

The middle great period of the geologist—that of the Secondary division—possessed, like the earlier one, its herbs and plants, but they were of a greatly less luxuriant and conspicuous character than their predecessors, and no longer formed the prominent trait or feature of the creation to which they belonged. The period had also its corals, its crustaceans, its molluscs, its fishes, and, in some one or two exceptional instances, its dwarf mammals. But the grand existences of the age, the existences in which it excelled every other creation, earlier or later, were its huge creeping things—its enormous monsters of the deep,—and, as shown by the impressions of their footprints stamped upon the rocks, its gigantic birds. It was peculiarly the

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age of egg-bearing animals, winged and wingless. Its wonderful *whales*, not, however, as now, of the mammalian, but of the reptilian class, — ichthyosaurs, plesiosaurs, and cetiosaurs, must have tempested the deep; its creeping lizards and crocodiles, such as the teleosaurus, megalosaurus, and iguanodon, — creatures, some of which more than rivalled the existing elephant in height, and greatly more than rivalled him in bulk, must have crowded the plains, or haunted by myriads the rivers of the period; and we know that the footprints, of at least one of its many birds, are of fully twice the size of those made by the horse or camel. We are thus prepared to demonstrate, that the second period of the geologist was peculiarly and characteristically a period of whale-like reptiles of the sea, of enormous creeping reptiles of the land, and of numerous birds — some of them of gigantic size; and, in meet accordance with the fact, we find that the second Mosaic period with which the geologist is called on to deal was a period in which God created the fowl that flyeth above the earth, with moving [or creeping] creatures, both in the waters and on the land, and what our translation renders great whales, but what I find rendered in the margin, great sea-monsters.

The Tertiary period had also its prominent class of existences. Its flora seems to have been no more conspicuous than that of the present

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time; its reptiles occupy a very subordinate place; but its beasts of the field were by far the most wonderfully developed, both in size and numbers, that ever appeared upon earth. Its mammoths and its mastodons, its rhinoceroses and its hippopotami, its enormous dinotherium and colossal megatherium, greatly more than equalled in bulk the hugest mammals of the present time, and vastly exceeded them in number. The remains of one of its elephants, *Elephas primigenius*, are still so abundant amid the frozen wastes of Siberia, that what have been not inappropriately termed "ivory quarries" have been wrought among their bones for more than a hundred years. Even in our own country, of which, as I have already shown, this elephant was for long ages a native, so abundant are the skeletons and tusks, that there is scarcely a local museum in the kingdom that has not its specimens dug out of the Pleistocene deposits of the neighborhood. And with this ancient elephant there were meetly associated in Britain, as on the Northern Continents generally all around the globe, many other mammals of corresponding magnitude. "Grand, indeed," says an English naturalist, "was the fauna of the British Islands in those early days. Tigers, as large again as the biggest Asiatic species, lurked in the ancient thickets; elephants of nearly twice the bulk of the largest individuals that now exist in Africa or Ceylon, roamed

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in herds; at least two species of rhinoceros forced their way through the primæval forest; and the lakes and rivers were tenanted by hippopotami as bulky, and with as great tusks, as those of Africa." The massive cave-bear, and large cave-hyæna, belonged to the same formidable group, with at least two species of great oxen (*Bos longifrons* and *Bos primigenius*), with a horse of smaller size, and an elk (*Megaceros Hibernicus*), that stood ten feet four inches in height. Truly, this Tertiary age — this third and last of the great geologic periods — was peculiarly the age of great "beasts of the earth after their kind, and of cattle after their kind."

Permit me, at this stage, in addressing myself to a London audience, to refer to what has been well termed one of the great *sights* of London. An illustration drawn from what must be familiar to you all, may impart to your conceptions respecting the facts on which I build a degree of tangibility which otherwise they could not possess.

One of, perhaps, the most deeply interesting departments of your great British Museum — the wonder of the world — is that noble gallery, consisting of a suite of rooms, opening in line, the one beyond the other, which forms its rich store-house of organic remains. You must, of course, remember the order in which the organisms of that gallery are ranged. The visitor is

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first ushered into a spacious room devoted to fossil plants, chiefly of the Coal Measures. And if these organisms are in any degree less imposing in their aspect than those of the apartments which follow in the series, it is only because that, from the exceeding greatness of the Coal-Measure plants, they can be exhibited in but bits and fragments. Within less than an hour's walk of the Scottish capital there are single trees of this ancient period deeply embedded in the sandstone strata, which, though existing as mere mutilated portions of their former selves, would yet fail to find accommodation in that great apartment. One of these fossil trees — a noble araucarian — which occurs in what is known as the Granton quarry, is a mere fragment, for it wants both root and top, and yet what remains is sixty-one feet in length, by six feet in diameter; and beside it there lies a smaller araucarian, also mutilated, for it wants top and branches, and *it* measures seventy feet in length, by four feet in diameter. I saw lately, in a quarry of the Coal Measures, about two miles from my dwelling-house, near Edinburgh, the stem of a plant allied to the dwarfish club-mosses of our moors, considerably thicker than the body of a man, and which, reckoning on the ordinary proportions of the plant, must have been at least seventy feet in height. And of a kind of aquatic reed, that more resembles the diminutive mare's-

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tail of our marshes than aught else that now lives, remains have been found in abundance in the same coal-field, more than a foot in diameter, by thirty feet in length. Imposing, then, as are the vegetable remains of this portion of the national museum, they would be greatly more imposing still, did they more adequately represent the gigantic flora of the remote age to which they belong.

Passing onwards in the gallery, from the great plants of the Palæozoic division to the animals of the Secondary one, the attention is at once arrested by the monstrous forms on the wall. Shapes that more than rival in strangeness the great dragons, and griffins, and "laithly worms," of mediæval legend, or, according to Milton, the "gorgons, hydras, and chimeras dire," of classical fable, frown on the passing visitor; and though wrapped up in their dead and stony sleep of ages, seem not only the most strange, but also the most terrible, things on which his eye ever rested. Enormous jaws, bristling with pointed teeth, gape horrid in the stone, under staring eye-sockets a full foot in diameter. Necks that half equal in length the entire body of the boa-constrictor, stretch out from bodies mounted on fins like those of a fish, and furnished with tails somewhat resembling those of the mammals. Here we see a winged dragon that, armed with sharp teeth and strong claws, had careered

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through the air on leathern wings like those of a bat; there an enormous crocodilian-whale, that, mounted on many-jointed paddles, had traversed in quest of prey the green depths of the sea; yonder an herbivorous lizard, with a horn like that of the rhinoceros projecting from its snout, and that, when it browsed amid the dank meadows of the Wealden, must have stood about twelve feet high. All is enormous, monstrous, vast, amid the creeping and flying things, and the great sea-monsters of this division of the gallery.

We pass on into the third and lower division, and an entirely different class of existences now catch the eye. The huge mastodon, with his enormous length of body, and his tusks projecting from both upper and under jaw, stands erect in the middle of the floor — a giant skeleton. We see beside him the great bones of the megatherium, — thigh-bones eleven inches in diameter, and claw-armed toes more than two feet in length. There, too, ranged species beyond species, are the extinct elephants; and there the ponderous skull of the dinotherium, with the bent tusks in its lower jaw, that give to it the appearance of a great pickaxe, and that must have dug deeply of old amid the liliaceous roots and bulbs of the Tertiary lakes and rivers. There, also, are the massive heads and spreading horn-cores of the *Bos primigenius*, and the

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large bones and broad, plank-like horns of the great Irish elk. And there, too, in the same apartment, but leaning against its further wall, —last, as most recent, of all the objects of wonder in that great gallery,—is the famous human skeleton of Guadaloupe, standing out in bold relief from its slab of grey limestone. It occurs in the series, just as the series closes, a little beyond the mastodon and the mammoths; and in its strange character, as a fossil-man, attracts the attention scarce less powerfully than the great Palæozoic plants, the great Secondary reptiles, or the great Tertiary mammals.

I last passed through this wondrous gallery at the time when the attraction of the Great Exhibition had filled London with curious visitors from all parts of the empire; and a group of intelligent mechanics, fresh from some manufacturing town of the Midland Counties, were sauntering on through its chambers, immediately before me. They stood amazed beneath the dragons of the Oolite and Lias; and with more than the admiration and wonder of the disciples of old when contemplating the huge stones of the Temple, they turned to say, in almost the old words, "Lo! master, what manner of great beasts are these?" "These are," I replied, "the sea-monsters and creeping things of the second great period of organic existence." The reply seemed satisfactory, and we passed on

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together to the terminal apartments of the range appropriated to the Tertiary organisms. And there, before the enormous mammals, the mechanics again stood in wonder, and turned to inquire. Anticipating the query, I said, "And these are the huge beasts of the earth, and the cattle of the third great period of organic existence; and yonder, in the apartment, you see, but at its further end, is the famous fossil-man Guadaloupe, locked up by the petrifactive agencies in a slab of limestone." The mechanics again seemed satisfied. And, of course, had I encountered them in the first chamber of the suite, and had they questioned me respecting the organisms with which *it* is occupied, I would have told them that they were the remains of the herbs and trees of the *first* great period of organic existence. But in the chamber of the mammals we parted, and I saw them no more.

There could not be a simpler incident. And yet, rightly apprehended, it reads its lesson. You have all visited the scene of it, and must all have been struck by the three salient points, if I may so speak, by which that noble gallery lays strongest hold of the memory, and most powerfully impresses the imagination, — by its gigantic plants of the first period (imperfectly as these are represented in the collection), by its strange misproportioned sea-monsters and creeping things of the second, and by its huge mam-

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mals of the third. Amid many thousand various objects, and a perplexing multiplicity of detail, which it would require the patient study of years even partially to classify and know, these are the great prominent features of the gallery, that involuntarily, on the part of the visitor, force themselves on his attention. They at once pressed themselves on the attention of the intelligent, though unscientific mechanics, and I doubt not still dwell vividly in their recollections; and I now ask you, when you again visit the national museum, and verify the fact of the great prominence of these classes of objects, to bear in mind that the gallery in which they occur represents, both in the order and character of its contents, the course of creation. I ask you to remember that, had there been human eyes on earth during the Palæozoic, Secondary, and Tertiary periods, they would have been filled in succession by the great plants, the great reptiles, and the great mammals, just as those of the mechanics were filled by them in the museum. As the sun and moon, when they first became visible in the heavens, would have seemed to human eyes — had there been human eyes to see — not only the greatest of the celestial lights, but peculiarly the prominent objects of the epoch in which they appeared, so would these plants, reptiles, and mammals, have seemed in succession, the prominent objects of the several epochs

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in which *they* appeared. And asking the geologist to say, whether my replies to the mechanics were not, with all their simplicity, true to geological fact, and the theologian to say, whether the statements which they embodied were not, with all their geology, true to the scriptural narrative, I ask, further, whether (of course, making due allowance for the laxity of the terms, botanic and zoological, of a primitive language unadapted to the niceties of botanic or zoologic science), the Mosaic account of creation could be rendered more essentially true than we actually find it, to the history of creation, geologically ascertained. If, taking the Mosaic days as equivalent to lengthened periods, we hold that, in giving their brief history, the inspired writer seized on but those salient points that, like the two great lights of the day and night, would have arrested most powerfully during these periods a human eye, we shall find the harmony of the two records complete. In your visit to the museum, I would yet further ask you to mark the place of the human skeleton in the great gallery. It stands, — at least it stood only a few years ago, — in the same apartment with the huge mammifers. And it is surely worthy of remark that, while in both the sacred and geologic records, a strongly defined line separates between the period of plants and the succeeding period of reptiles; and, again, between the pe-

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riod of reptiles and the succeeding period of mammals, no line in either record separates between this period of mammals and the human period. Man came into being as the last-born of creation, just ere the close of that sixth day — the third and terminal period of organic creation — to which the great mammals belong.

Let me yet further remark, that in each of these three great periods we find, with respect to the classes of existences, vegetable or animal, by which they were most prominently characterized, certain well-marked culminating points, together, if I may so express myself, — twilight periods of morning dawn and evening decline. The plants of the earlier and terminal systems of the Palæozoic division are few and small; it was only during the protracted *eons* of the Carboniferous period that they received their amazing development, unequalled in any previous or succeeding time. In like manner, in the earlier or Triassic deposits of the Secondary division, the reptilian remains are comparatively inconsiderable; and they are almost equally so in its Cretaceous or later deposits. It was during those middle ages of the division represented by its Liassic, Oolitic, and Wealden formations that the class existed in that abundance which rendered it so peculiarly, above every other age, an age of creeping things and great sea-monsters. And so also in the Tertiary, regarded as but an early por-

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tion of the human division, there was a period of increase and diminution, a morning and evening of mammalian life. The mammals of its early Eocene ages were comparatively small in bulk and low in standing; in its concluding ages, too, immediately ere the appearance of man, or just as he had appeared, they exhibited, both in size and number, a reduced and less imposing aspect. It was chiefly in its middle and latter, or Miocene, Pliocene, and Pleistocene ages, that the myriads of its huger giants,—its dinotheria, mastodons, and mammoths, cumbered the soil. I, of course, restrict my remarks to the three periods of organic life, and have not inquired whether aught analogous to these mornings and evenings of increase and diminution need be sought after in any of the others.

Such are a few of the geological facts which lead me to believe that the *days* of the Mosaic account were great periods, not natural days; and, be it remembered, that between the scheme of lengthened periods and the scheme of a merely local chaos, which existed, no one knows how, and of a merely local creation, which had its scene, no one knows where, geological science leaves us now no choice whatever. It has been urged, however, that this scheme of periods is irreconcilable with that Divine "reason" for the institution of the Sabbath which he who ap-

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pointed the day of old, has, in his goodness vouchsafed to man. I have failed to see any force in the objection. God, the Creator, who wrought during six periods, rested during the seventh period; and as we have no evidence whatever that he recommenced his work of creation — as, on the contrary, man seems to be the last formed of creatures — God may be resting still. The presumption is strong that his Sabbath is an extended period, not a natural day, and that the work of Redemption is his Sabbath-day's work. And so I cannot see that it in the least interferes with the integrity of the reason rendered, to read it as follows: — Work during six periods, and rest on the seventh; for in six periods the Lord created the heavens and the earth, and on the seventh period *he* rested. The Divine periods may have been very great, the human periods very small; just as a vast continent or the huge earth itself is very great, and a map or geographical globe very small; but if, in the map or globe, the proportions be faithfully maintained, and the scale, though a minute one, be true in all its parts and applications, we pronounce the map or globe, notwithstanding the smallness of its size, a faithful copy. Were man's Sabbaths to be kept as enjoined, and in the Divine proportions, it would scarcely interfere with the logic of the "reason annexed to the

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fourth commandment," though in this matter, as in all others in which man can be an imitator of God, the imitation should be a miniature one.

The work of Redemption may, I repeat, be the work of God's Sabbath day. What, I ask, viewed as a whole, is the prominent characteristic of geologic history, or of that corresponding history of creation, which forms the grandly-fashioned vestibule of the sacred volume? Of both alike the leading characteristic is progress. In both alike do we find an upward progress from dead matter to the humbler forms of vitality, and from thence to the higher. And after great cattle and beasts of the earth had, in due order, succeeded inanimate plants, sea-monsters, and moving creatures that had life, the moral agent, man, enters upon the scene. Previous to his appearance on earth, each succeeding elevation in the long upward march had been a result of creation. The creative fiat went forth, and dead matter came into existence. The creative fiat went forth, and plants, with the lower animal forms, came into existence. The creative fiat went forth, and the oviparous animals—birds and reptiles, came into existence. The creative fiat went forth, and the mammiferous animals—cattle and beasts of the earth, came into existence. And, finally, last in the series, the creative fiat went forth, and responsible, immortal man,

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came into existence. But has the course of progress come, in consequence, to a close? No! God's work of elevating, raising, heightening — of making the high in due progression succeed the low — still goes on. But man's responsibility, his immortality, his God-implanted instincts respecting an eternal future, forbid that that work of elevation and progress should be, as in all the other instances, a work of creation. To create would be to supersede. God's work of elevation now is the work of fitting and preparing peccable, imperfect man, for a perfect, impeccable, future state. God's seventh day's work is the work of Redemption. And, read in this light, his reason vouchsafed to man for the institution of the Sabbath is found to yield a meaning of peculiar breadth and emphasis. God, it seems to say, rests on *his* Sabbath from his creative labors, in order that by his Sabbath-day's work he may save and elevate you; rest ye also on your Sabbaths, that through your coöperation with him in this great work ye may be elevated and saved. Made originally in the image of God, let God be your pattern and example. Engaged in your material and temporal employments, labor in the proportions in which he labored; but in order that you may enjoy an eternal future with him, rest also in the proportions in which he rests.

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One other remark, ere I conclude. In the history of the earth which we inhabit, molluscs, fishes, reptiles, mammals, had each in succession their periods of vast duration; and then the human period began — the period of a fellow-worker with God, created in God's own image. What is to be the next advance? Is there to be merely a repetition of the past? — an introduction a second time of man made in the image of God? No! The geologist in those tables of stone, which form his records, finds no example of dynasties, once passed away, again returning. There has been no repetition of the dynasty of the fish — of the reptile — of the mammal. The dynasty of the future is to have glorified man for its inhabitant; but it is to be the dynasty — "the *kingdom*," not of glorified man made in the image of God, but of God himself in the form of man. In the doctrine of the two conjoined natures, human and Divine, and in the further doctrine that the terminal dynasty is to be peculiarly the dynasty of HIM in whom the natures are united, we find that required progression beyond which progress cannot go. We find the point of elevation never to be exceeded meetly coincident with the final period never to be terminated — the infinite in height harmoniously associated with the eternal in duration. Creation and the Creator meet at one point and in one person.

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